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FORMULATION AND EVALUATION OF ANTIOXIDANT RICH NATURAL LIPBALM FOR ULTIMATE NOURISHMENT.

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ABSTRACT

The main objective of this study was to formulate and evaluate an antioxidant-rich natural lip balm for ultimate lip nourishment and protection. Lips. The use of natural antioxidants in lip care formulations helps in protecting lips from oxidative damage while providing hydration and nourishment. The lip balm was formulated using the extract of *Punica granatum*, *Camellia sinensis (L.) Kuntze*, and other ingredients beeswax, cocoa butter, lanolin, vitamin E, olive oil, Phenoxyethanol+ethylhexylglycerin, vanilla flavour oil. These ingredients were selected for their moisturizing, protective, healing, and free radical scavenging activities. Different formulations F1, F2, F3 were prepared by varying ingredients and concentration. All formulations were evaluated for various parameters such as colour, odour, appearance, homogeneity, pH, spreadability, melting point, stability, and antioxidant activity. The antioxidant potential of the formulated lip balm was assessed using suitable in-vitro methods. The results indicated that the formulations were smooth, non-irritant, stable, and showed good antioxidant activity along with excellent moisturizing properties. All three formulations were excellent in different aspects, but overall, F3 demonstrated excellent anti-oxidant property compared to F1 and F2.

KEYWORDS: *Punica granatum*, *Camellia sinensis (L.) Kuntze*, Antioxidant activity, natural lip balm.

INTRODUCTION

Cosmetics are substances, either synthetic or natural, applied to the body to beautify, cleanse, or enhance appearance without modifying bodily structures or functions. They encompass skincare products, makeup, haircare items, oral hygiene products, and fragrances. Although cosmetics are commonly utilized to enhance beauty, certain products may contain detrimental chemicals that cause health hazards, including skin irritation or carcinogenic effects. Recognizing these hazards is crucial, as cosmetics significantly influence both the fashion sector and everyday existence.[1]

Punica granatum, the scientific name for pomegranate belongs to the family Lythraceae. It is a fruit well known for its rich content of antioxidants, vitamins, and polyphenols. Pomegranate extract or oil is commonly used as an ingredient in antioxidant lip balms because it helps to protect the lips from oxidative stress caused by sunlight, pollution, and environmental damage. It provides deep nourishment, helps retain moisture, and improves lip softness and smoothness. Additionally, pomegranate has regenerative properties that aid in healing dry, cracked lips and enhances the natural color and health of the lips. Pomegranate is a round shaped edible fruit of 5-12 cm diameter with a thick skin, usually pink or red. The core of the fruit has a spongy white tissue that creates spaces full of edible bags, known as arils.[2]

Green tea is a natural herbal ingredient widely recognized for its potent antioxidant and therapeutic properties, making it an important component in pharmaceutical and cosmetic formulations. It is obtained from the dried leaves of Camellia sinensis under the family Theaceae and it is minimally processed, which helps retain a high concentration of bioactive compounds.[3]

Lip balm is a semi-solid cosmetic preparation used for the protection, moisturization, and healing of dry, chapped and cracked lips. The skin of the lips is very thin and sensitive and lacks sebaceous glands, making it more prone to dryness, dehydration, and damage. therefore, lip balm plays an important role in maintaining lip health and softness. Many lip balms also include added benefits such as SPF to shield against a sun damage.it also reduce the pain associated with chapped lips. The ingredients used to prepare lip balm maintain the moisture of the lips and promote the healing of chapped lips. The formulation of lip balm typically involves a carefully balanced combination of waxes, oils, butters, emollients and active ingredients.[4]

2. MATERIALS AND METHODS

2.1 Plant collection and method

The biological source of pomegranate is *Punica granatum* which belongs to the family *Lythracea*. The pomegranate fruit were purchased from local market of Pattambi, Palakkad, Kerala in the month of October. The biological source of green tea is *Camelia sinensis* which belongs to the family *Theaceae*. The fresh green tea leaves were collected from Munnar plantation in the month of October. It is then authentified and certified by NSS arts and science college Parakkulam, Palakkad, kerala-67955.

Figure 1: ***Punica granatum.***

Figure 2: ***Camellia sinensis (L.) Kuntze.***

2.2 Drying

Leaves were collected and dried under shade. Then they were stored in air tight container for further use. This helps to remove all impurities present in the collected leaves. Drying helps to remove the excess moisture present in them and this process helps to avoid destruction of excess moisture.

2.3 Preparation of plant extract

2.3.*1 Punica granatum* seed and peel extract

Fresh fruits of pomegranate are collected and rinse thoroughly under running water. Slice off the top of the fruit without cutting too deep and gently pull apart the sections, separate the seeds and peel into sections, then shade dried. Weigh accurately 25g of dried pomegranate seed and peel separately. Place the seeds and peel separately in iodine flask. Avoid packing too tightly to allow proper solvent penetration. Pour ethanol over pomegranate seed and peel until they are completely submerged. Ethanol is added in the ratio of 1:10. The mixture was subjected to maceration for 72 hours with intermittent stirring using a magnetic stirrer at low speed. After 72 hours the mixture was filtered through muslin cloth. Clear filtrate was concentrated on Heating Mandle.Concentrated extract was stored in an air tight container at 4℃ for further use.

Figure 3: *Punica granatum peel* extraction.

Figure 4: *Punica granatum* seed extraction.

2.3.2 *Camellia sinensis (L.) Kuntze* leaf extract

Green tea leaves are collected and dried by shied dry method then crushed. Weigh accurately 25g of dried green tea leaves and transferred in to clean iodine flask. Ethanol was added in the ratio 1:10 ratio. The mixture was subjected to maceration for 72 hours with intermittent stirring using a magnetic stirrer at low speed. After 72 hours the mixture was filtered through muslin cloth. Clear filtrate was concentrated on Heating Mandle. Concentrated extract was stored in an air tight container at 4℃ for further use.

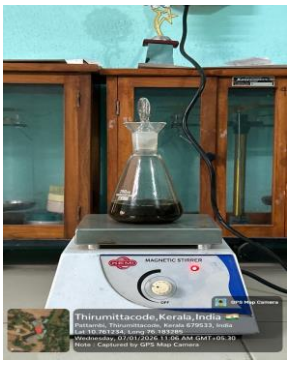

Figure 5: *Camellia sinensis* leaf extraction.

2.4 PREPARATION OF LIPBALM

The required quantities of beeswax, cocoa butter, and lanolin were taken in a clean china dish using digital weighing balance. The china dish was placed in a water bath maintained at 60-70℃, ensuring a gentle and uniform heating process. Direct flaming is avoided to prevent degradation of oils and butters. The ingredients were melted together on a low to medium heat with occasional stirring until a clear and uniform molten mass was obtained. To the molten mixture, olive oil was added slowly and mixed thoroughly using a glass rod to ensure homogeneity. The mixture was then removed from heat and allowed to cool slightly. Upon further cooling of the mixture, heat- sensitive herbal extracts was added carefully. Pomegranate seed, peel extract and green tea extract were added slowly in specified quantities. Stirring was continued to achieve a uniform distribution of colour and bioactive components. Care was taken to avoid vigorous stirring, which might introduce air bubbles. At a further reduced temperature vanilla flavour oil and vitamin E oil is added. Vanilla flavour oil was added to enhance fragrance. Vitamin E oil was added as a powerful antioxidant to improve shelf life of the product. Phenoxyethanol & ethylhexylglycerin were incorporated as preservatives with continuous gentle stirring. Beetroot juice was added to obtain desired natural colour. Immediately after the complete incorporation of all ingredients, the liquid lip balm was poured carefully to the containers. The containers left undisturbed at room temperature to allow the lip balm to solidify naturally. then allow for further evaluation and testing.[5]

Table no.1: Formulation of lip balm.

Sl No.	Ingredients	F1	F2	F3
1	Beeswax	2.5gm	2.5gm	2.5gm
2	Cocoa butter	2gm	2gm	2gm
3	Lanolin	1.5gm	1.5gm	1.5gm
4	Olive oil	3gm	3gm	3gm
5	Vitamin E	0.2ml	0.2ml	0.2ml
6	Vanilla flavour oil	1-2drops	1-2drops	1-2drops
7	Phenoxyethanol+ethylhexylglycerin	0.4ml	0.4ml	0.4ml
8	Pomegranate seed extract	1ml	2ml	3ml
9	Pomegranate peel extract	1ml	3ml	2.5ml
10	Green tea extract	1ml	2ml	2.5ml
11	Beetroot juice	Q. S	Q. S	Q. S

3 EVALUATION TEST FOR LIPBALM

3.1. Organoleptic characteristics

The prepared lip balm was evaluated for the following organoleptic characteristics such as Colour, Odour, Appearance, Taste. All parameters were assessed visually and manually to ensure consumer acceptability.[6]

3.2. Spreadability

Spreadability of the lip balm was evaluated at room temperature by applying a small quantity of the formulation repeatedly on a clean glass slide. The formulation was observed for: Uniform spreading, formation of a smooth protective layer, presence of breakage, fragmentation, or deformation during application. Grading criteria for spreadability: G (Good): Lipbalm spreads smoothly, does not break, and maintains its original shape, I (Intermediate): Lipbalm spreads uniformly with minor fragmentation or slight deformation during application, B (Bad): Lipbalm shows poor spreading, severe deformation, difficulty in application or breaks into several pieces.[7]

3.3. Determination of pH

The pH of the Lipbalm formulation was determined by dissolving 1g of the lipbalm in 100ml distilled water. The solution was stirred properly and the pH was measured using pH meter.[8]

3.4. Melting point

The melting point of the lipbalm was determined using the capillary tube method. A small quantity of the sample was filled into a capillary tube which was then placed in a melting point apparatus fitted with a thermometer.[9]

3.5. Stability Study

Stability studies were carried out for a period of one month.The formulations were observed periodically for changes in colour, odour, texture, and phase separation.

3.6. Homogeneity

Homogeneity of the formulation was assessed by spreading a small quantity of lip balm on a transparent glass slide. The sample was visually examined for the presence of any lumps, grittiness, or non-uniform distribution. A homogeneous formulation without phase separation was considered satisfactory.[10]

3.7. Skin irritancy test

The skin irritancy test was carried out by applying lip balm on the skin for 10 min and ensure that it does not cause any irritation, redness, itching or inflammation when applied to the skin. [11]

3.8. Anti-oxidant activity

The evaluation of antioxidant activity of pomegranate seed, peel and green tea was determined by DPPH(2,2-diphenyl-1-picryl-hydrazyl).

DPPH solution preparation

0.004g of DPPH was dissolved in ethanol of volume 100ml in dark room. The extract of pomegranate seed, peel and green tea was taken and dissolved in ethanol. The test solution was dilute to different concentration by serial dilutions. The different concentrations of sample prepared were 10,20,40,60.

Preparation for standard

The standard for antioxidant activity taken in this study was ascorbic acid where the solution of same is prepared by dissolving 1g of ascorbic acid in 10ml of ethanol. This stock solution was serially diluted separately to obtain different concentrations.

Procedure

One ml of all the dilutions was taken in separate test tubes and 3ml of previously prepared DPPH solutions to each test tube. Then kept in incubator for 30min and care should be taken to not exposed to light. At 517nm DPPH shows its absorbency and at the same wave length sample absorbance was taken by a UV-Visible spectrophotometer. Then comparison made between the absorbance of a sample and the absorbance of ascorbic acid(standard).[12]

4. RESULT AND DISCUSSION

4.1 Organoleptic evaluation

The formulation was light pinkish semi solid preparation with smooth homogenous texture.

Table no. 2: Physical appearance of formulated lip balm.

Characteristics	Result
colour	Light pinkish
Odour	Sweet odour
Texture	Smooth homogenous
Homogeneity	Good

4.2 Spreadability

Spreadability test was done to ensure the spreadability, the prepared formulation was found to be good spreadability.

Table no. 3: Spreadability of formulated lip balm.

Diameter	Spreadability
5.4	Good

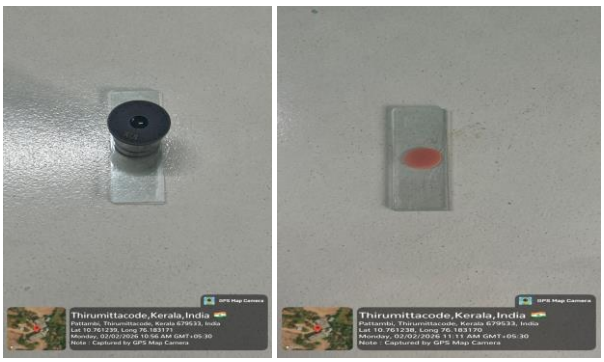

Figure 6: Spreadability test.

4.3 pH Measurement

The pH of the formulation was measured using calibrated PH meter. The skin and lip having a natural PH 4.5 to 6.5.

Table no.4: pH of formulated lip balm.

Formulation	pH
F1	5.24
F2	4.51
F3	5.75

Figure 7: pH determination.

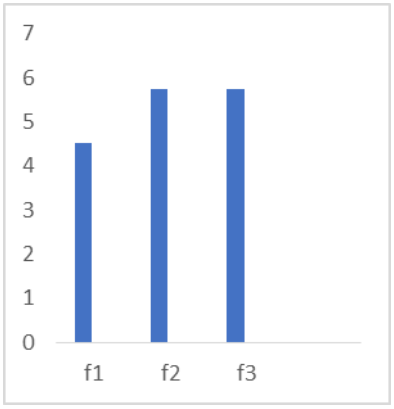

Figure 8: pH determination.

4.4 Melting point

The melting point of formulated lip balm was found to be in range of 65℃ which matches with the appropriate melting point of between 60℃- 75℃.

Table no. 5: Melting point of formulated lipbalm.

Formulation	Melting point
F1	63℃
F2	68℃
F3	65℃

4.5 Stability test

The formulated lipbalm was kept for one month and compared with original pH.

Table no. 6: stability of formulated lipbalm.

Parameter	40±2℃	25±2℃	4±2℃
Colour	Pink	Pink	Pink
Odour	Sweet	Sweet	Sweet
Melting point	6.5	6.5	6.5
Spreadability	Good	Good	Good
pH	5.75	5.75	5.75

4.6 Homogeneity test

The formulated lipbalm was found to be homogenous and no grittiness is noted.

Table no. 7: Homogeneity of formulated lipbalm.

Formulation	Homogeneity
F1	Good
F2	Good
F3	Very good

4.7 Skin irritation test

No signs of redness, itching or inflammation were observed after applying for 10 minutes. The herbal lipbalm formulation was found to be non-irritant and safe for topical application.

4.8 Antioxidant activity

The antioxidant activity of prepared lip balm was measured using DPPH (2,2-diphenyl-1-picrylhydrazyl) method. The reading was made on a spectrometer at 517nm.Clear DPPH solution is taken as blank and ascorbic acid is used as standard.

Ascorbic acid [standard]

Table no.8: Determination of standard.

Concentration(µg/ml)	Absorbance	% scavenging activity
10	0.50	44.4%
20	0.38	57.8%
40	0.26	71.1%
60	0.14	84.0%

Table no. 9: Determination of formulated lipbalm.

Formulation	Absorbance	% scavenging activity
F1	0.61	32.2%
F2	0.49	45.6%
F3	0.35	61.1%

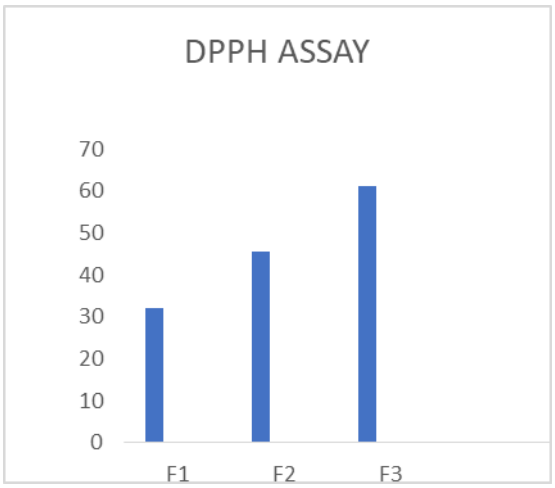

Figure 9: DPPH Assay.

Figure 10: Determination of antioxidant activity.

The DPPH radical scavenging activities of the lip balm formulation were evaluated. The result indicated that all formulated lip balm exhibited notable free radical scavenging activity. The formulation F3 demonstrated the highest antioxidant activity at 61.1%. The values were observed in comparison to the standard ascorbic acid, which shows 84.0%.

5. SUMMARY AND CONCLUSION

The result of this study confirms that a herbal antioxidant lipbalm formulated with Punica granatum and Camellia sinensis exhibits promising antioxidant activity, making it an effective alternative to synthetic lipbalm. The optimized formulation(F3) showed better spreadability, stability and overall efficiency in combating dry and chapped lips caused by climatic and environmental factors. In future this lipbalm can be used as better and natural option instead of chemical lipbalm. The study supports the potential use of herbal ingredients in pharmaceutical and cosmetic formulation, promoting safer and more sustainable lip care products. Further clinical evaluations and long-term stability studies are recommended to enhance the product's commercial viability and ensure broader consumer safety.

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